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By

Wayne Dennis

Brooklyn College

and

Pergrouhi Najarian

American University of Beirut

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Infant Development Under Environmental Handicap¹

WAYNE DENNIS AND PERGROUHI NAJARIAN

Brooklyn College and the American University of Beirut

RIBBLE (10, 11) and Spitz (12, 13, 14, 15, 16) have proposed that if certain stimulus deprivations occur in early childhood the consequences are drastic and enduring. These views have arisen largely from observation of infants in institutions. The supporting evidence has consisted in part of scores of institutional subjects on infant tests and in part upon general impressions of the emotional states of the children.

This report is concerned with behavioral development in an institution whose care of infants is in some respects identical with, and in some respects quite different from, that described in other studies.

The data were obtained in a foundling home in Beirut, Lebanon, which, because of inadequate financial support, is able to provide little more than essential physical care. We will report upon the developmental status of two age-groups of children in this institution: those between 2 months and 12 months of age, and those between 4½ and 6 years of age. After describing the environmental conditions and presenting the data we will discuss the relationship of this study to previous

studies, and to theories of child development.

THE CRECHE

The institution in which the study was conducted will be called the Creche, although this is not the formal name of the home. The Creche is a home for infants and young children operated by a religious order (of nuns). All children in the Creche are received shortly after birth. They arrive via two routes. The majority come from a maternity hospital operated by the religious order referred to previously. An unmarried woman being attended by this hospital may arrange to have her infant taken to the Creche. In so doing she relinquishes claim to the infant and may not see or visit it thereafter. The remainder of the Creche population consists of infants left upon the doorstep of the institution. Nothing is known definitely concerning their parents, but it is likely that the majority of these infants, too, are illegitimate.

The Creche is nearly 30 years old but it has a new building which was completed in the spring of 1955, and for which the order is still indebted. The building is an excellent one, being fireproof, sunny, and airy. The infant beds and other pieces of equipment are new and modern. The appearance of the institution fails to reveal that it exists month after month upon inadequate and uncertain contributions. The feeding, clothing, and housing of the children have the first claim upon the Creche's meager income. The most stringent economy must be exercised in regard to expenditures for personnel. For this reason the number of persons taking care of the children

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FIG. 1

is extremely limited. Understaffing is the direct cause of whatever deficiencies may characterize the child-care practices to be described later.

Naturally the number of children in the institution varies from time to time with the advent of new arrivals, and departures due to deaths, or to transfer to other institutions to which the children are sent at about six years of age. The size of the staff, too, is subject to some variations. However, estimates made at two periods separated by five months agree in showing that for each person directly concerned with the care of the children—i.e., those who feed the children, change diapers, bathe and clothe them, change their beds, nurse them when they are ill, supervise their play, and teach them—there are 10 children. This ratio of 1 to 10 includes those on night duty as well as on day duty. It does not, however, include personnel who work in the kitchen, laundry, and mending room, nor those who do the cleaning. It does not include the four nuns who constitute the administrative staff and who frequently assist in direct care. Clearly this is an extremely limited staff. The essential functions can be accomplished only by means of hurried procedures and long hours of work.

From birth to one year there is no assignment of individual children to particular attendants. Rather, a room of children is assigned jointly to several caretakers and observation showed no consistent relationships between attendants and children. At later ages, each group of children is assigned most of the day to a supervisor and an assistant.

During the first two months of life the infant

is taken out of his crib only for his daily bath and change of clothes. He is given his bottle while lying on his back in his crib, because ordinarily no one has time to hold it. The nipple is placed in his mouth and the bottle is propped up by a small pillow. Bathing and dressing are done with a maximum of dispatch and a minimum of mothering.

In conformity with a widespread Near Eastern practice, the infant is swaddled from birth. Figure 1 illustrates the type of swaddling used. The baby has his arms as well as his legs enclosed in tight wrappings, and hence the scope of his movements is greatly restricted. During the early weeks the infant is bound as depicted except when being bathed and dressed. No fixed schedule is followed in regard to freedom from swaddling, but in general the hands are freed at about two months of age, and swaddling is ended at about four months. Swaddling is continued for a longer period during the winter months than during the remainder of the year because the wrappings of the child serve to keep him warm.

As shown in Fig. 2, each crib has a covering around the sides. This is present to protect the child from drafts, but as a consequence the child can see only the ceiling and the adults who occasionally come near him.

The adults seldom approach him except at feeding times. When they feed him they do not usually speak to him or caress him. When two or three persons are feeding twenty infants, many of them crying, there is no tendency to dally.

At about four months of age the child is removed to a room for older infants. He is placed in a larger crib, but for several further months his care remains much the same as it has been.



FIG. 2

A typical scene in the room is shown in Fig. 2. A toy is usually placed in each crib, but it soon becomes lodged in a place inaccessible to the child and remains there. The child remains in this second crib until he begins to pull to the edge of the crib and faces some danger of falling out. At this point, he is usually placed during his waking hours with one or two other children in a play pen. This situation is illustrated in Fig. 3. Sometimes he is placed in a canvas-bottomed baby chair, as shown in Fig. 4, but this is usually done only for short periods of time. The older child takes his daytime naps in the play pens. He is returned to his crib at night and tightly tucked in. The child graduates from room two to another room at one year of age or slightly thereafter. Some description of the care of older children will be given on later pages.

Until about four months of age the infant's food consists of milk, supplemented by vitamins. The feedings during this time are on a schedule of six feedings per day at daytime intervals of three hours. After four months bottle feeding is gradually reduced in frequency. It ceases at about twelve months.

The introduction of cooked cereals begins at four months, and fruit juices, crushed bananas, apple sauce, and vegetables are begun at five months. Depending upon the preferences of an attendant a child is sometimes given these supplementary foods held in arms, sometimes while sitting in chairs, and sometimes lying down. Beginning at eight months, eggs and chopped meat are occasionally given. Feeding times are reduced to five times per day at four months and to four times per day at one year. Toilet training is begun between 10 and 12 months.

Children are weighed at weekly intervals. Seri-



FIG. 3



FIG. 4

ous efforts are made to give special feeding to infants who are not gaining properly but again staff limitations make it difficult for an attendant to spend much time with any one child. The average weight during the first six months, based on records of the infants which we tested, is appreciably below what is ordinarily considered desirable (see Table 1). Comparable data are not available for other Lebanese children. No data are available on children beyond six months of age at the Creche.

From about one year to about three years the children spend much of the day in play groups of about twenty children with a supervisor and an assistant. Equipment is limited to a few balls, wagons, and swings. From three to four years of age much of the day is spent seated at small tables. The children are occupied in a desultory way with slates, beads, and sewing boards. At about four years they are placed in kindergarten within the Creche where training in naming objects and pictures, writing, reading, and numbers is begun. Instruction is given in both Arabic and French.

Diet and medical care are under the supervision of a physician who devotes, gratis, about one hour per day to the Creche, whose population is about 140 children. During the winter months colds are common, and pneumonia occasionally occurs. The usual childhood illnesses occur. When a contagious disease enters the Creche it is likely to become widespread since there are no facilities for isolation of infectious cases. We do not have adequate statistics on mortality. It is our impression that it is high in the first three months of life, but not particularly high thereafter. Mortality seems especially high among those infants who are found on the doorstep, many of whom are suffering from malnu-

TABLE 1
AVERAGE WEIGHTS OF CRECHE INFANTS

Statistic	Boys						
	Birth	1 mo. ^a	2 mo.	3 mo.	4 mo.	5 mo.	6 mo.
	Average weight in grams 2926	3233	3746	4365	4926	5555	5984
Number of cases	Girls						
	Birth	1 mo.	2 mo.	3 mo.	4 mo.	5 mo.	6 mo.
	28	28	28	27	23	18	16
Average weight in grams	Boys						
	Birth	1 mo.	2 mo.	3 mo.	4 mo.	5 mo.	6 mo.
	2727	2985	3353	3858	4436	4910	5463
Number of cases	Girls						
	Birth	1 mo.	2 mo.	3 mo.	4 mo.	5 mo.	6 mo.
	13	12	13	13	11	10	8

^a In computing this average, for each child the record of weight taken nearest age 1.0 month was employed. A similar procedure was used at other ages.

trition, exposure, or disease upon admission. In evaluating institutional mortality it should be noted that in some areas of Lebanon the crude death rate in the first year among children in homes is as high as 375 per 1000 (6).

THE COMPARISON GROUP

For comparison with behavioral records of the Creche infants, data were obtained from children brought to the Well Baby Clinic of the American University of Beirut Hospital. All well babies of appropriate age who were brought to the clinic on certain days were tested. They were from among the poorer, but not the poorest, segments of the Beirut population.

All children tested were living at home and were brought to the clinic by their mothers. The majority were being breast fed. We did not obtain detailed data on swaddling, but typically the younger babies were brought in swaddled and the older ones unwaddled. It is our impression that swaddling customs among the poorer half of the Beirut population approximate those of the Creche. This conclusion is supported by a study by Wakim (17). Other comparison data were provided by American norms and certain Lebanese norms to be described later.

THE TESTING PROGRAM

For the subjects under one year of age the Cattell infant scale was employed (2). This scale was selected because among available tests it seemed to offer

the most objective procedures for administration and scoring. It provides five items for each month from two to 12 months of age, with one or two alternate items at each age level.

The procedures described in the test manual were carefully followed. They call for testing each infant at a level at which he passes all tests, at a level he fails all tests, and at all intermediate levels.

Several items on the test were not applicable to the Creche group because they require the examiner to obtain information from the mother or other caretaker. Among such items are babbles, anticipates feeding, inspects fingers, says "dada," etc. Attendants at the Creche could not supply the information required by these items. For this reason, "alternate" items provided by Cattell and based on direct observation were regularly substituted for these items. In the case of the comparison infants, all age-appropriate items, including all alternates, were administered; but in computing developmental scores for comparative purposes identical items were used for the Creche and the comparison groups.

At the 4½-to-6-year level the tests used were the Goodenough draw-a-man test,

the Knox cube test, and the Porteus maze test. These were chosen because it was judged that they might be but little affected by the environmental handicaps of the Creche children. They have the further advantage of requiring a minimum of verbal instructions.

In giving and scoring the draw-a-man test, Goodenough procedures (5) were followed. For the other two tests the procedures and norms employed were those given in the Grace Arthur Scale of Performance Tests, Revised Form II (1).

NUMBER OF SUBJECTS

We tested all subjects who fell into our age categories upon two series of testing dates. The only exceptions consisted of children who were ill or who had just undergone serious illness. The infant tests were given to 49 Creche infants and the 41 comparison cases. Since rather few of the Creche infants were above six months of age at the time of our first period of testing, during our second testing period we tested all infants who were six months of age and over even though this meant retesting in 13 cases. For this reason the number of test scores for the 49 Creche infants is 62.

In the 4½-to-6-year group, Goodenough tests were given to 30 subjects, and the Knox cube test and the Porteus maze test were each given to 25 subjects. None was retested.

RESULTS

For the infants, Table 2 indicates by age levels the score earned on each test. The Creche scores are shown by O-symbols, the comparison scores by X-symbols. Scores are grouped by step intervals of ten points. Thus, examining the figure by beginning at the top of column one, one finds that between 2.0 and 2.9 months of age one comparison infant had a develop-

mental quotient between 140 and 149, two comparison infants had quotients between 130 and 139, etc.

Examination of Table 2 shows that at the two-months age level there is little if any difference between the two groups. The mean of the Creche group is 97, that of the comparison group 107. These means, each based on only 8 cases, are not significantly different from each other or from the American norms. However, at all ages beyond 3.0 months the Creche infants score definitely lower than either the comparison or the normative groups, whose records are indistinguishable.

If all scores from 2 to 12 months are averaged, the Creche mean is 68, the comparison mean 102. For the 3-to-12-month period the mean of the Creche scores is 63, (*SD* 13), that of the comparison group 101 (*SD* 15), a difference of 38 points. This is a very large and highly significant difference ($P < .001$). In this age range all of the comparison infants tested above the mean of the Creche subjects and all of the Creche subjects were below the mean of the comparison group. No Creche baby between 3 and 12 months had a DQ above 95.

Before discussing the results of the infant tests we turn now to the tests given to Creche children between 4.5 and 6 years of age. We note first that there are reasons to believe that the subjects tested at 4.5 to 6.0 years of age performed, as infants, at the same level as did the children whose test results have just been presented. Because procedures of admission to the Creche have not changed in recent years the two groups of infants can be assumed to be genetically similar. Since practically all infants who enter the Creche remain for six years, there are no selective influences between admission and six years. The only qualification of this statement regards infant mortality,

TABLE 2
INDIVIDUAL INFANT SCORES BY AGE*

Scores	Age in Months									
	2	3	4	5	6	7	8	9	10	11
140-149	X									
130-139	XX		X							
120-129	X	X					X			
110-119	OO		X		XX	XX		X		
100-109	OOXX	XXXX	X	XX		X	XX	X	XX	
90-99	OO	O		XX		OX				
80-89	OOX	OX	XXXXXX			O		O		O
70-79		OO	OOX		OO			O	OO	
60-69		O	OOOOOO	OOOOO	O	X	O	O	O	O
50-59	X	OO	OOO	OO	O	O		OO	OO	OO
40-49			O		OO	OOO			O	

* Creche infant scores are indicated by O; comparison infants by X.

whose selective action so far as psychological tests are concerned is unknown, here as elsewhere. According to the supervisory staff there have been no changes in child care within the past six years.

The results of the performance tests are shown in Table 3. It will be noted that the data there reported agree remarkably well in showing that on these tests the development of the Creche children is only about 10 per cent below the norms of American home-reared children. In a separate report (3) it has been shown that on the Goodenough test Lebanese children at the five-year level make scores equivalent to the American norms. No Lebanese norms are available for the

Knox cube or Porteus maze tests but there is no reason to believe that they would be higher than the published standards. In other words, there is evidence that the environment of the Creche produces only a slight retardation among four- and five-year-olds on these tests.

In summary, the data show that, with respect to behavioral development, children in the Creche are normal during the second month of age, are greatly retarded from 3 to 12 months of age, and almost normal on certain performance tests between 4.5 and 6 years of age.

INTERPRETATIVE DISCUSSION

To a reader acquainted with the numerous and often divergent opinions concerning the effects of early environment, the results just reported may, on the surface, only serve to confuse further the already unclear picture. We believe, however, that we can show that these data and others can be fitted into a coherent view.

Early Normality of Creche Infants

The fact that the Creche subjects had DQ's of approximately 100 during the second month, and presumably during the first month also, should not be sur-

TABLE 3
RESULTS OF PERFORMANCE TESTS

Test	Various "DQ" Scores				
	N	Range	Median	Mean	SD
Goodenough	30	58-136	93	93	20
Porteus maze ^a	25	69-150	89	95	20
Knox cube ^b	25		100		

^a Four children earned fewer than 4 points, which is the minimum score for which Arthur gives a mental age. Since the lowest MA given by Arthur is 4.5, these children were arbitrarily given a mental age of 4 years and DQ's were computed accordingly. Obviously these scores affect the mean and SD but not the median.

^b On this test, 11 of the 25 subjects scored below the 4.5 MA, the lowest age for which Arthur gives norms. Because of the large number below 4.5 no arbitrary scores were given. Of the 14 subjects who earned MA's of 4.5 and above, one had a DQ of 80 and two of 100. The remaining scores ranged from 101 to 165. The median of 100 seems representative.

prising. It has not been shown that any stimulus deprivation will affect infant behavioral development during the first two months. The twins reared under experimental conditions by Dennis and Dennis (4) made normal progress during this period. The infants tested by Spitz (12) had a mean developmental quotient of 130 during the second month. The supernormality of this score was probably due to the inadequacy of test norms rather than to institutional influence.

If it is true that restricted stimulation has little or no effect upon early behavioral development, this can be due to at least two different causes. One explanation would be in terms of maturation. Perhaps growth of the nervous system, apart from sensory stimulation, is alone responsible for postnatal behavioral growth during the first two months. A second explanation lies in the possibility that sensory experience is essential, but that for the tests presented to him the infant even when swaddled hand and foot and lying on his back obtains sufficient stimulation.

For the Cattell infant tests the second interpretation is not altogether unreasonable. Of the five tests which we employed at the two-months level, four are given to the infant while lying on his back and the responses required are visual. These are "inspects environment," "follows moving person," "follows moving ring vertically," and "follows moving ring horizontally." Since the infants spend nearly 24 hours per day in a supine position in a well lighted room, and some movement occurs near them, there is considerable opportunity to practice visual pursuit movements.

The fifth item among the two-month tests is lifting head when prone. The Creche infants are placed on the abdomen for a short time daily while being bathed, dried, and dressed. For this reason, lifting the head while in this position can be practiced and direct observation shows that it is practiced. Possibly the Creche infants respond normally to the items given them at two months because the required responses are well practiced. However, the possibility that maturation alone is sufficient for the development of the items is not ruled out.

Retardation Between Three and Twelve Months of Age

Beyond the two-months level the majority of items on the Cattell scale require that the infant be tested in a sitting position while being held on the lap of an adult. Sitting is a position to which the Creche infants under about ten months of age are relatively unaccustomed. They are not propped up in their beds or placed in chairs before that age. The first occasion for placing the infants in a sitting position may come with the introduction of semisolid foods, but we have noted that some of the infants are given these while lying down. Perhaps as a consequence of inexperience in being held upright the infants as a group make a poor record on the test item which involves holding the head erect and steady. This unsteadiness of the head, plus general unfamiliarity with sitting, may account in part for the low scores earned on certain purely visual items. These are "regards cube," "regards spoon," "follows ball," and "regards pellet."

Many of the remaining items involve not only sitting but in addition manual skills directed by vision. Among the items are "picks up spoon," "picks up cube," "grasps pellet," "grasps string," "lifts cup," "takes two cubes," "exploits paper," "pulls out peg," etc. Between ages five and seven months, the age placement given these items, the infants have little opportunity to practice visuo-manual coordinations in a sitting position and, further, visuo-manual coordinations are not required or encouraged even in a lying position.

Analysis of other items whose placement is between three and twelve months reveals that practically all of them require manual skills and require adjustment to visually presented objects. It is suggested that the relationship between

the items and the environmental restrictions experienced by the children account for the low scores made by the Creche subjects.

We examined the records made by the Creche children aged 3 months and above on each item, expecting that one or two items might be found in regard to which their performance is normal. We were able to find none. But we were also unable to find an item in this age range on which the subjects were judged to receive a normal amount of relevant experience.

It is interesting to note two items on which the subjects are very deficient even though the motor component of the item is clearly present. These involve turning to sound. In one of these items, the child, sitting on the lap of an adult, is required to turn toward the experimenter who stands by the shoulder of the seated adult, and calls the infant's name. The second item is similar but a small hand-bell is used instead of the voice. The first item has an age placement of four months, the second, five months. Of 36 children tested between 4.0 and 10.0 months of age only one turned to the voice and only 4 turned to the bell.

Now all of the children turned to and followed a moving person in the field of view. The difficulty of the item apparently lies in the subject's lack of associations with sounds. We have noted that in approaching a child or providing services for a child the attendants seldom speak to him. This seems to be due partly to the fact that the attendants are too busy. A second relevant fact is that, with 20 children in a room, and the windows open to rooms containing 100 additional children, it is seldom quiet enough at feeding times and bathing times to encourage verbal greetings. So far as we could determine no event which happens to a Creche baby is consistently preceded by a sound signal. These conditions seem to explain the finding that the infants seldom turned to a voice or a ringing bell only a few inches from their ears.

From the preceding discussion it will be obvious that we tend to attribute the retardation of Creche subjects between 3 and 12 months of age to a lack of learning opportunities relative to the Cattell test items.

Relationship of the 3-to-12-Month Retardation to the Findings of Other Studies

There seems to be a superficial, if not a basic, disagreement between the results here reported, and those of other studies, particularly those of Dennis and Dennis (4) and those of Spitz (12-16). We wish to comment on the apparent divergences and to indicate how they can be reconciled.

In a study of a pair of twins named Del and Rey who were reared under experimentally controlled conditions until thirteen months of age, Dennis and Dennis found that, while the subjects were retarded beyond the range of ordinary subjects in regard to the appearance of a few responses, the subjects' development in general equalled that of home-reared infants. The few specific retardations occurred on items in respect to which the infants could not engage in self-directed practice, namely, visually directed reaching, sitting without support, and supporting self with the feet. These retardations seem consonant with the behavior of the Creche subjects. However, the prevailing normality of Del and Rey seems at variance with the Creche findings.

To begin with, certain differences between the environmental conditions of the subjects in the two studies should be noted. For one thing, the adult-child ratios in the two studies were very different. In the Del-Rey study there were two subjects and two experimenters, a one-to-one ratio. In the Creche, the adult-child ratio is one to ten, a greatly different situation. In the Dey-Rey study the environmental restrictions in regard to learning were rather severe in the beginning, but were gradually relaxed as desired data were obtained. In the Creche, very limited opportunities for learning

and practicing responses continue throughout the first year. Certain specific contrasts may be mentioned: Del and Rey were kept in larger and deeper cribs, were less restrained by clothing and consequently probably had more opportunities for motor experimentation than did the Creche infants. Further, Del and Rey may have received more handling and more varied exposure to stimuli than did the Creche infants. However, there can be no doubt that in several respects Del and Rey suffered as much a restriction of experience as did the Creche infants. Speech was not directed to Del and Rey nor did adults smile in their presence until they were six months of age. No toys were provided until the twelfth month. They were not placed in a sitting position until they were over eight months of age.

But it is our belief that the difference between the normality of Del and Rey and the retardation of the Creche infants is due to the use of different indices of behavioral development rather than to real differences in behavior. In the Del-Rey study no general scale of infant development was administered. The majority of the developmental data reported for Del and Rey consisted of noting when each of a number of common infant responses first appeared. That is, the observers recorded when each subject first brought hand to mouth, first grasped bed-clothes, first vocalized to person, first laughed, etc. The initial date of occurrence of such responses cannot be determined by testing. The Del-Rey data are longitudinal and the Del-Rey records were found to be normal when compared with similar data obtained in other observational studies.

Now since observation in the Del-Rey study was directed primarily toward responses which could occur at any time

and did not require the introduction of test conditions, it follows that poverty of environmental stimulation would not be expected to yield much evidence of retardation. The child left to his own devices on his back in his crib can bring his hand to his mouth, grasp his bed clothes, vocalize, observe his own hands, grasp his own hands, grasp his own foot, bring foot to mouth, etc. These are the items which were observed. One of the major findings of the Del-Rey study was that the untutored infant does do these things, and does them within the usual age range of home-reared babies.

In regard to such responses it *may* be that the Creche babies are normal. The relevant facts can be discovered only by observers each spending full time observing a few infants. If all Creche infants were to be observed it would necessitate the presence of many additional observers or caretakers. The reader is reminded that the Del-Rey investigation, involving only two infants, took a major part of the time of the two observers for one year. To devote one year, or even one month to observing each Creche subject cannot be proposed in an institution which has severe limitations of caretaker personnel. In contrast to the requirements of an observational study of development, the testing time in the Creche study was only 10 to 30 minutes per subject.

If we cannot compare Del and Rey with the Creche babies in terms of observational data, it is likewise not possible to compare them in terms of test data. It is impossible to estimate in retrospect with any degree of confidence how Del and Rey would have scored at various times during the first year on the Cattell Infant Scale. We arrive, therefore, at the following conclusion: It is likely infants with restricted learning opportunities are normal on "observational" items but re-

tarded on "test" items. It is believed that the latter, but not the former, are influenced by environmental limitations. If this is a correct interpretation, the Del-Rey study and the Creche study are two sides of the same coin. However, to establish that this is the case appears to be a very difficult research assignment.

We consider next the work of Spitz. The observations by Spitz which seem most closely related to the present study concern the institution called Foundling Home. Here, as at the Creche, there was a shortage of personnel. Although the mothers were present in the institution for several months, they seem to have had little contact with their children aside from breast-feeding them. Pinneau (9) points out that Spitz does not explain why this was the case. Despite the presence of the mothers in the institution the adult-child ratio in the nursery is reported to be about 1 to 8. The children spent most of their time for many months on their backs in their cribs, as did the Creche infants. At one point Spitz reports that a hollow worn in their mattresses restrained their activity. This, however, was definitely not true of the Creche infants.

Since Spitz's studies have been extensively reviewed and criticized by Pinneau, only a limited amount of space will be devoted to them here. Spitz used some form of the Hetzer-Wolf baby tests. There is no doubt that their standardization leaves much to be desired. Spitz reports scores for the Foundling Home group and a control group of 17 home-reared infants. In the second month both groups had mean DQ's between 130 and 140. The private home group remained at that level but the mean of the Foundling Home group dropped precipitously to 76 by the sixth month and to 72 by the end of the first year. Spitz believes

that this decline in DQ was due to the emotional consequences of separation from the mother, but Pinneau has pointed out that most of the decline took place prior to the prevalent age of separation. Pinneau indicates further that at least some of the decline is probably due to inadequate test standardization.

We compare our data with those of Spitz with considerable hesitation because the two sets of data were obtained by tests whose comparability is unknown. In numerical terms the results of the two studies in the second half of the first year seem to agree fairly well, Spitz's mean for this period being about 74 and ours 63. But the findings for the first half-year present some apparent differences. Our subjects drop from a mean of 97 to a mean of 72 between the second and third months, and drop only ten additional points thereafter. Spitz's group starts higher and declines for a longer period.

Spitz's data and ours agree in finding that environmental conditions can depress infant test scores after the second month of life. We disagree with Spitz in regard to the interpretation of the cause of the decline. He believes it to have been due, in the case of his subjects, to a break of the emotional attachment to the mother. This could not have been the cause of the decline of the Creche infants. Since the conditions for the formation of an emotional tie to a specific individual were never present, no breach of attachment could have occurred. We have noted above Pinneau's demonstration that even Spitz's own data do not support his interpretation. We believe that Spitz's data as well as ours are satisfactorily interpreted in terms of restricted learning opportunities. We suggest that an analysis of the relationship between test items and the conditions prevailing in the Foundling Home would reveal

that retardation could readily be explained in terms of restriction of learning opportunities. But such restriction is not inherent in institutional care. Klackenberg has recently presented a study (7) of infant development in a Swedish institution, in which the adult-child ratio was 1 to 2 or 3, in which no retardation was found.

Discussion of the Creche Four- and Five-Year Olds

We have no doubt that on many tests the Creche four- and five-year-olds (and also two- and three-year-olds) would be retarded, perhaps to a marked degree. We think this would be particularly true in regard to tests involving more than a very modest amount of language comprehension and language usage. The language handicap of institutional children with limited adult contact has been sufficiently demonstrated (8).

It is likely that on some performance tests the Creche children also would score below available norms. On the Healy Picture Form Board, for example, most of the incidents represented are outside the experience of Creche children. We assume that the older Creche children are retarded on some tests, but we wish to determine whether retardation is general or whether it is related to specific environmental handicaps.

We chose the draw-a-man test, the Knox cube test and the Porteus maze test because it was thought that the Creche environment might affect these tests less than other tests. So far as the Knox cubes are concerned, it is difficult to imagine how one can deprive a child of the experience of visually remembering just-touched objects, except through loss of sight. So far as the Goodenough is concerned, both human beings and two-dimensional representations of them were

familiar to the subjects. They were also familiar with the idea of drawing and with the use of pencils. Knowledge of the use of pencils may also play a part in the Porteus maze test. It is uncertain what other experience may play a role in this test.

The results show clearly that on these tests the Creche children approximated the performance of children in normal environments. In other words, the retardation which was found to exist between 3 and 12 months of age did not produce a general and permanent intellectual deficit. It is possible for infants who have been retarded through limitations of experience at an early age level to perform normally, at least in some respects, at later age periods. The assumption that early retardation produces permanent retardation does not receive support from our data.

Emotional and Personality Effects

No doubt many readers would like to know the emotional and personality consequences of the Creche regime. So would we. But to the best of our knowledge no objective and standardized procedures with adequate norms are available which would enable us to compare the Creche infants with other groups of children in these respects. This is equally true of studies conducted earlier.

In the absence of objective techniques, we can only report a few impressions. The Creche infants were readily approachable and were interested in the tests. Very few testing sessions were postponed because of crying, from whatever cause. There was very little shyness or fear of strangers, perhaps because each infant saw several different adults. In the cribs there was very little if any crying that did not seem attributable to hunger or discomfort. However, some of the older babies developed automatisms such as arching the back strongly, or hitting some part of the body with the hand, which may have represented a type of "stimulation hunger." It was almost always possible to get the infants over two months of age to smile by stroking their chins or

cheeks or by shaking them slightly. The older children, like the infants, were friendly and approachable. However, such observations are not meant to imply that other personality consequences could not be found if adequate techniques existed.

SUMMARY AND CONCLUSIONS

This study has been concerned with the development of children in an institution in Beirut, Lebanon, called the Creche, in which "mothering" and all other forms of adult-child interaction are at a minimum because the institution is seriously understaffed. The children come to the institution shortly after birth and remain until six years of age. Contact with the mother ceases upon the child's entrance to the institution and contact with mother-substitutes is slight because the adult-child ratio is 1 to 10.

Opportunity for developing infant skills through practice is very slight. In the early months the infants are swaddled. For many months the infant lies on his back, and is even fed in a supine position. He is not propped up, carried about, or provided with the means of practicing many activities.

Data on behavioral development were obtained by giving the Cattell infant scale to all infants between two and twelve months of age and the Good-enough draw-a-man test, the Knox cube test, and the Porteus maze test to all children between 4½ and 6 years of age. Comparison data were available from American norms and from certain groups of Lebanese subjects.

It was found that in terms of developmental quotients, the mean quotient at two months was approximately 100. Between three and twelve months the mean

was 63. In the tests given at the four- and five-year level, the mean scores were roughly 90.

Possible interpretations of these data have been discussed at some length. Our conclusions may be summarized as follows:

1. It is uncertain whether the normality of behavior at two months shows that maturation plays a major role in early development, or whether experience, limited as it was, provided the essential requirements for learning the responses which were tested.
2. The retardation prevailing between three and twelve months of age seems to be due to lack of learning opportunities in situations comparable to the test situations. It is possible that an observational approach in the day-by-day situation might reveal that some behaviors developed normally.
3. The infants did not undergo loss of an emotional attachment. There is nothing to suggest that emotional shock, or lack of mothering or other emotion-arousing conditions, were responsible for behavioral retardation.
4. Retardation in the last 9 months of the first year to the extent of a mean DQ of 65 does not result in a generally poor performance at 4½ to 6 years, even when the child remains in a relatively restricted environment. The study therefore does not support the doctrine of the permanency of early environmental effects.
5. It is believed that the objective data of other studies, as well as this one, can be interpreted in terms of the effects of specific kinds of restrictions upon infant learning.

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